CLAIMS:

What is claimed is:

1. A gas injection system in a plasma processing device comprising:

a gas injection assembly body configured to receive a process gas from at least one mass flow controller;

a consumable gas inject plate coupled to said gas injection assembly body, said consumable gas inject plate comprising at least one orifice to distribute said process gas to said plasma processing device;

a pressure sensor coupled to said gas injection assembly body and configured to measure a gas injection pressure within a gas injection plenum formed by said gas injection assembly body and said consumable gas inject plate; and

a controller coupled to said pressure sensor and configured to determine a state of said consumable gas inject plate from a change in said gas injection pressure.

2. The gas injection system recited in claim 1, further comprising a gas inject plate between said gas injection assembly body and said consumable gas inject plate.

3. The gas injection system recited in claim 1, wherein said consumable gas inject plate comprises one of silicon, carbon, silicon carbide, quartz, alumina, and coated metal.

4. The gas injection system as recited in claim 1, wherein said change in said gas injection pressure results from at least one of a change in a processing pressure in said plasma processing device and a change in a mass flow rate of said process gas.

5. The gas injection system as recited in claim 1, wherein said controller determines a response time for the change in said gas injection pressure and

compares the response time with a first time delay in a first time trace corresponding to when said at least one orifice of said consumable gas inject plate corresponds to a non-eroded state.

6. The gas injection system as recited in claim 1, wherein said controller determines a response time for the change in said gas injection pressure and compares the response time with a second time delay in a second time trace when said at least one orifice of said consumable gas inject plate corresponds to an eroded state.

7. The gas injection system as recited in claim 6, wherein said second time delay is less than a time delay corresponding to when said at least one orifice of said consumable gas inject plate corresponds to an eroded state.

8. The gas injection system as recited in claim 6, wherein said state of said consumable gas inject plate is determined by a comparison of said response time to said first time delay.

9. The gas injection system as recited in claim 6, wherein said state of said consumable gas inject plate comprises a partially eroded state when said second time delay ranges from 25% to 75% of a first time delay corresponding to when said at least one orifice of said consumable gas inject plate corresponds to an non-eroded state.

10. The gas injection system as recited in claim 6, wherein said state of said consumable gas inject plate comprises a fully eroded state when said second time delay is less than 25% of a first time delay corresponding to when said at least one orifice of said consumable gas inject plate corresponds to an eroded state.

11. A plasma processing device comprising:

a plasma processing chamber;

a gas injection system coupled to said plasma processing chamber, said gas injection system comprising a gas injection assembly body configured to receive a process gas from at least one mass flow controller; and a consumable gas inject

plate coupled to said gas injection assembly body, said consumable gas inject plate comprising at least one orifice to distribute said process gas to said plasma processing chamber;

a diagnostic system, said diagnostic system comprising a pressure sensor coupled to said gas injection assembly body and configured to measure a gas injection pressure within a gas injection plenum formed by said gas injection assembly body and said consumable gas inject plate; and

a controller coupled to said pressure sensor and configured to determine a state of said consumable gas inject plate from a change in said gas injection pressure.

12. The plasma processing device recited in claim 11, further comprising a gas inject plate between said gas injection assembly body and said consumable gas inject plate.

13. The plasma processing device recited in claim 11, wherein said consumable gas inject plate comprises one of silicon, carbon, silicon carbide, quartz, and coated metal.

14. The plasma processing device as recited in claim 11, wherein said change in said gas injection pressure results from at least one of a change in a processing pressure in said plasma processing chamber and a mass flow rate of said process gas.

15. The plasma processing device as recited in claim 11, wherein said controller determines a response time for the change in said gas injection pressure and compares the response time with a first time delay in a first time trace corresponding to when said at least one orifice of said consumable gas inject plate corresponds to a non-eroded state.

16. The plasma processing device as recited in claim 11, wherein said controller determines a response time for the change in said gas injection pressure and compares the response time with a second time delay in a second time trace

when said at least one orifice of said consumable gas inject plate corresponds to an eroded state.

17. The plasma processing device as recited in claim 16, wherein said second time delay is less than a time delay corresponding to when said at least one orifice of said consumable gas inject plate corresponds to an eroded state.

18. The plasma processing device as recited in claim 16, wherein said state of said consumable gas inject plate is determined by a comparison of said response time to said first time delay.

19. The plasma processing device as recited in claim 16, wherein said state of said consumable gas inject plate comprises a partially eroded state when said second time delay ranges from 25% to 75% of a first time delay corresponding to when said at least one orifice of said consumable gas inject plate corresponds to an non-eroded state.

20. The plasma processing device as recited in claim 16, wherein said state of said consumable gas inject plate comprises a fully eroded state when said second time delay is less than 25% of a first time delay corresponding to when said at least one orifice of said consumable gas inject plate corresponds to an non-eroded state.

21. A method of determining the state of a gas injection system in a plasma processing device comprising:

changing a process parameter in said plasma processing device to affect a change of a gas injection pressure in said gas injection system, said gas injection system comprising a gas injection assembly body configured to receive a process gas from at least one mass flow controller, a consumable gas inject plate coupled to said gas injection assembly body, said consumable gas inject plate comprising at least one orifice to distribute said process gas to said plasma processing device, a pressure sensor coupled to said gas injection system, and a controller coupled to said pressure sensor;

measuring a response time corresponding to a change of said gas injection pressure using said pressure sensor, wherein said response time corresponds to a

first time delay when said consumable gas inject plate exhibits a non-eroded state and said response time corresponds to a second time delay when said consumable gas inject plate exhibits an eroded state; and

comparing said response time with said first time delay in order to determine said state of said gas injection system.

22. The method recited in claim 21, further comprising a gas inject plate between said gas injection assembly body and said consumable gas inject plate.

23. The method recited in claim 21, wherein said consumable gas inject plate comprises one of silicon, carbon, silicon carbide, quartz, alumina, and coated metal.

24. The method as recited in claim 21, wherein said process parameter comprises at least one of a processing pressure in said plasma processing device and a mass flow rate of said process gas.

25. The method as recited in claim 21, wherein said first time delay is greater than said second time delay.

26. The method as recited in claim 21, wherein said state of said consumable gas inject plate is determined by a comparison of said response time to a fraction of said first time delay.

27. The gas injection system as recited in claim 21, wherein said state of said gas injection system comprises a partially eroded state when said response time ranges from 25% to 75% of said first time delay.

28. The gas injection system as recited in claim 21, wherein said state of said gas injection system comprises a fully eroded state when said response time is less than 25% of said first time delay.